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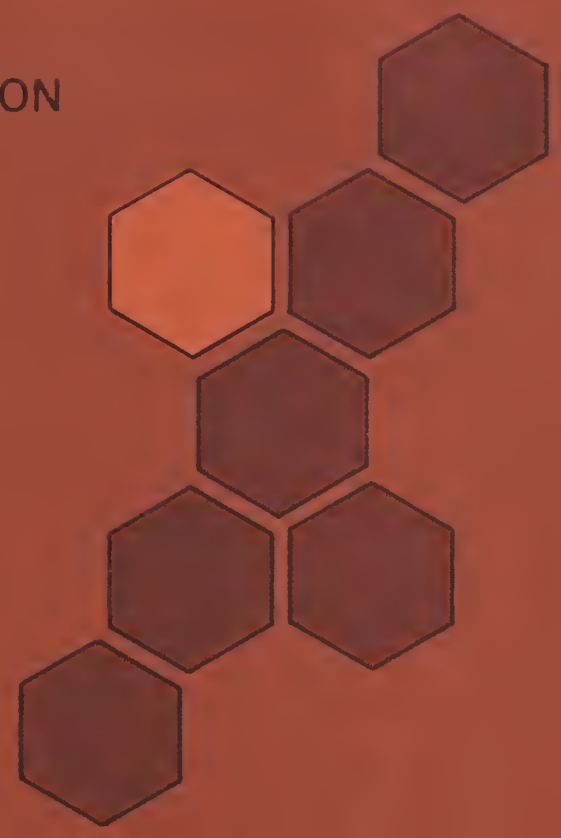

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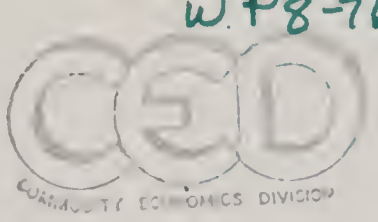

Land Use Adjustments Using Competitive Bidding

By

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Land Use Adjustments Using Competitive Bidding[1/]

P. Leo Strickland*

For almost four decades, American Agriculture has been characterized by excess supply which would clear the market at reasonable prices acceptable to farmers. Agricultural programs were developed which offered price supports and which limited production either by limiting the acreage of certain crops or by removing land from production. Both mandatory controls, such as acreage allotments with marketing quotas, and voluntary programs, such as the soil bank land retirement of the late fifties, the diversion programs of the sixties and the more recent voluntary set aside programs have been used.

These programs were relatively effective in meeting their objective. They were also very expensive to the government. Large sums of money were required for payments and for paying storage costs for the surplus commodities. The programs were inefficient in that all farmers were paid the same rate regardless of their cost of production and the rate was usually high enough to keep inefficient producers in operation. The programs were also generally designed to remove land from production. Thus, there was great incentive to increase production per acre on the land remaining in production.

In the early seventies, the situation changed drastically. Poor weather conditions caused Russia to purchase large quantities of grain

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from us. Several other countries were also short and purchased quantities of grain. Our surplus stocks were depleted. Food prices have soared. Poor weather conditions have prevented stocks from being rebuilt. Also, there is much concern that population growth will soon cause food demand to outstrip our ability to produce food. Thus, many people now think we may need programs which can induce, rather than limit, agricultural production.

Willard Cochrane states that policy to cope with the developments in agriculture during the next decade "must have the capacity to deal with continuing pressure of demand on supply, rising cost of producing food and a long run increase in the real price of food--Second, policy must have the capacity to turn around quickly to deal with short-run production and trade aberrations from trend--to deal with unpredictable short-run shortage and glut situations. Thus, the policy must be flexible--highly flexible." (3)

This report discusses an administrative mechanism which can be used to either limit or stimulate agricultural production at the least government cost. Land use adjustments would be accomplished using a competitive bid system. With this system, each farmer would specify the price at which he would take land out of production or what payment would induce him to bring land back in production if needed.

A competitive bid system is not new. It has been discussed for several years. Research has been conducted which indicated, it was, theoretically, the more efficient system for retiring land. However, for mechanical and political reasons a system has never been developed and implemented on a large scale basis.

It is our purpose to show that a system can be developed which can meet many purposes. It can incorporate features which give consideration to any number of factors before making the final selection as to the bids to accept. To develop these features will require coordination of research of several agencies and specification of data on compatable terms. However, such action can be accomplished if the desire exists to implement such action.

Fixed compensation rates for withdrawing land from production made previous cropland adjustment programs more costly than necessary. An inefficient producer was compensated at the same rate as an efficient producer. Thus to the inefficient producer, a portion of the payment was pure profit or an income transfer above the amount he would actually have netted from producing a crop on the land. Tom Miller (4) developed estimates for the 1972 programs on the portion of the payments theoretically needed to buy supply control and the remaining portion which he defined as income transfer to farmers. He estimated that 22 percent of the feed grain program payments, 48 percent of the wheat program payments, and 92 percent of the cotton program payments were income transfers above what would have been theoretically needed to obtain the desired production response. For the three programs combined, 46 percent of the total payments were income transfer.

In theory, a producer should be indifferent to choices if the returns are equal. Thus a producer should be willing to adjust cropland use if the compensation for adjustment is equal to the net profit he would have made from his next most profitable alternative. His decision would be made on the basis of expected net returns. The expected net returns would be the expected revenue (normal yields times expected price) less the expected variable cost of production (normal inputs times the

expected price).

A competitive bid system would allow each farmer to specify the compensation rate he requires to make a specified land use adjustment. The rate could be different for each producer. Income transfer would be nil because no farmer would be paid more than he required to induce performance.

A competitive bid system has been proposed previously. A pilot program was tested in four states in the late fifties. This program differed from the conservation reserve part of the soil bank in two respects. First, only whole farm units could be offered and, second, farmers were to submit a bid per acre which they were willing to accept rather than participate at a level set by the government. Bids were submitted through the county ASCS office and sent to the state offices. The summaries were then sent to the Soil Bank Division in Washington for final approval.

Bottom and associates (1) analyzed some of the characteristics of the bids. They also did a follow up survey of the participants to develop further characteristics. In the pilot program, the farmers' bids per acre increased as the crop value per acre increased. However, the bids as a percent of the crop value decreased as the crop value per acre increased. Of the farm owners in Nebraska, who were questioned about the program, 63 percent were favorable towards the use of such a program and 29 percent unfavorable. Nonfarm persons in the area had less favorable reaction: 60 percent expected the farm families to move from the area and seek employment elsewhere, thus hurting the local economy.

After the test, the program was never implemented. No reasons were publicly specified. However, the difficulty of compiling the bids and

the feeling that the bidding system did not evaluate a fair return to the land, i.e., the land would be retired on the basis of the bid and not an independent evaluation of the productivity are two reasons commonly advanced.

If these were legitimate reasons, computer technology permits us to overcome them. A computer program system can be designed which will adjust the bid on the basis of productivity or other desirable adjustment criterion, array the bids on a nationwide basis and then accept the bid on a specified acceptance criterion. This can be done in a rapid and efficient manner so that within a very few weeks after bidding closed, the bids could be analyzed and the successful bidders notified.

A Competitive Bid System

The basic premises of a bid system are:

1) A policy proposal can be specified in detail with definite adjustment objectives and constraints.
2) Producers, after evaluating performance requirements, can make a bid indicating the payment required in order to comply.
3) After producer bids are received, they can be evaluated on the basis of a prescribed adjustment criteria.

The policy proposal could be one of cropland or land use adjustment rather than a land retirement program. The program objectives could be stated in terms of acres to adjust, either retire or induce into production, and could include total cost goals. It could be used for inducing production or changes in production practices as well as for reducing production. The basis for operating the system would be the

same for any objective, one would be a bid to take land out of production, the other a bid to change production, from the viewpoint of the farmer, from a more profitable alternative to a less profitable one. For instance, payments could be made for converting pasture land to cropland and vise versa. Also to convert from conventional tillage to a specified alternative or from one crop to another. Specific crop rotations could be induced in leiu of certain fertilizer and pesticide applications.

The producer bid would be made on the basis of evaluating the program alternative in line with all other enterprises on the farm. He would likely evaluate the costs, returns, risk, labor requirements, and cash flow of the adjustment as he would for any other enterprise. His bid would then be the value forgone by meeting the performance requirements of the adjustment program. This bid would approximate the income figure of expected returns over variable costs but would have other factors included.

The program adjustment criteria could be varied. Major criticisms of past programs have been their costs and the lack of consideration of entangible factors. Within a bid system, several criteria or combinations can be used to evaluate acceptance of bids. For instance, bids could be evaluated on a cost per acre basis. Thus the bid with the lowest per acre cost would be accepted first regardless of location. However, if there was concern for the overall economic effect on a community, for the effect on conservation, for the effect on resource use or other factors, an index of the effect of these factors could be used to increase or decrease the relative value of each bid before the final selection was made.

A bid system would also give better possibility of meeting the specified objectives of the program. Specified treasury cost, acres of adjustment

or quantity of production adjusted could be controlled by the level of bid acceptance.

Basic Design of the System

The rest of this paper outlines and discusses the elements of a computerized bid evaluation procedure that could be used to select the bids to be accepted from among those submitted for a land use adjustment program. The basic design for the proposed system is shown in Figure 1. Each of the blocks represent one or more subroutines of a computer program. Some of these are accounting and sorting routines and could be developed very readily. Others involve decisions about adjustment possibilities and subjective weights to be included. Development of the weights and criterion will require further research and development.

Farm Rental Offer

The bid would be received in the county ASCS office or other designated agency on a specified form. The bid would be in one of three categories depending on the program, (1) dollars per acre, (2) dollars per farm (whole farm), (3) dollars per unit of production. Information on acreage and normal yield could be supplied by the farmer or the agency. It would be preferable to call the ASCS masterfile for the farm information if it is developed and computerized.[3/] To develop an effective program, it may also be desirable to combine some of the conservation and productivity classifications from SCS for inclusion in the basic information.

Land Use Ajustment Bid Evaluation Program

The bid received from the farmer could be adjusted to take into consideration multiple objectives of a land use adjustment program (Figure 2). The final output of this subroutine would be a single value which

Figure 1

Generalized Land Use Adjustment Program

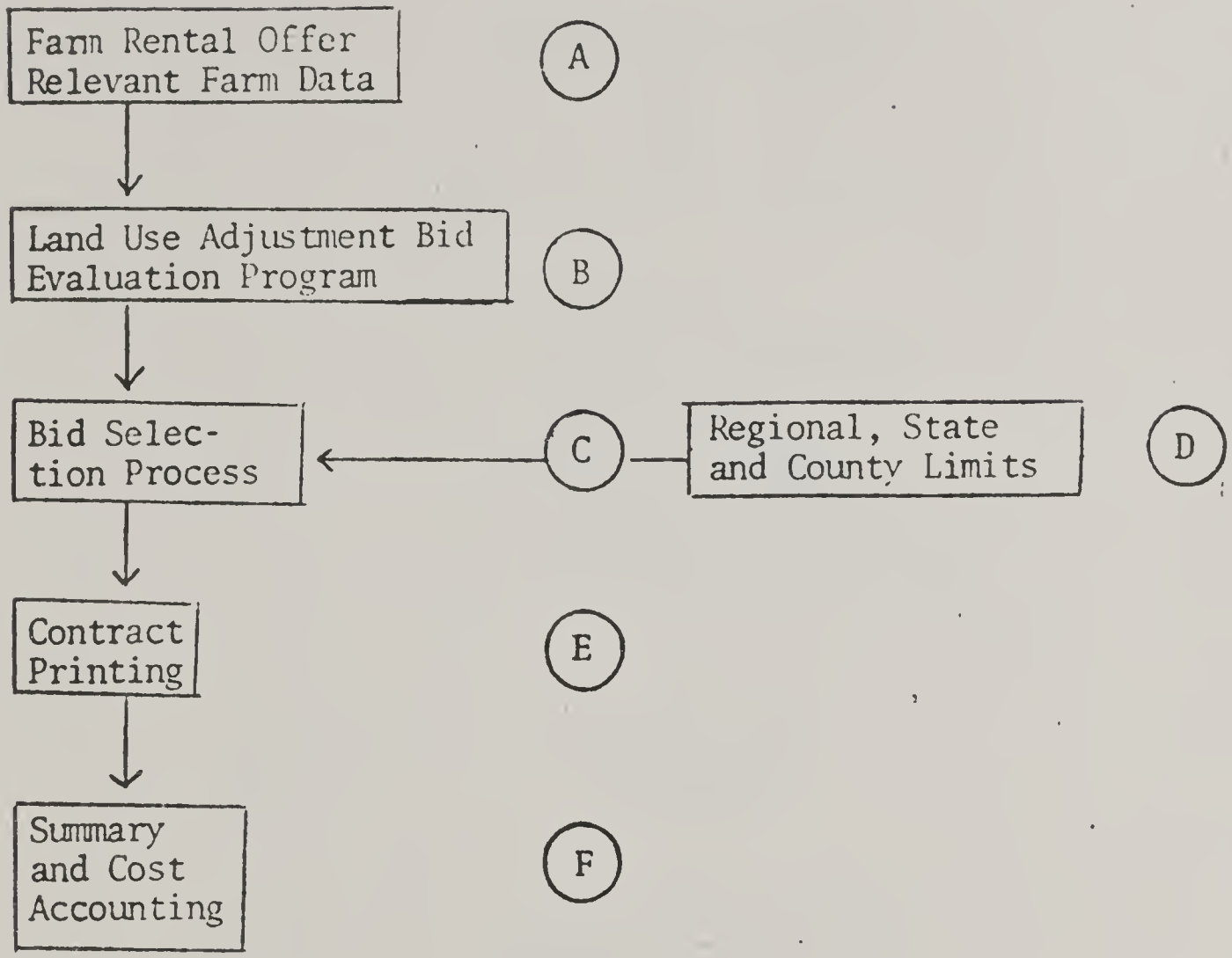
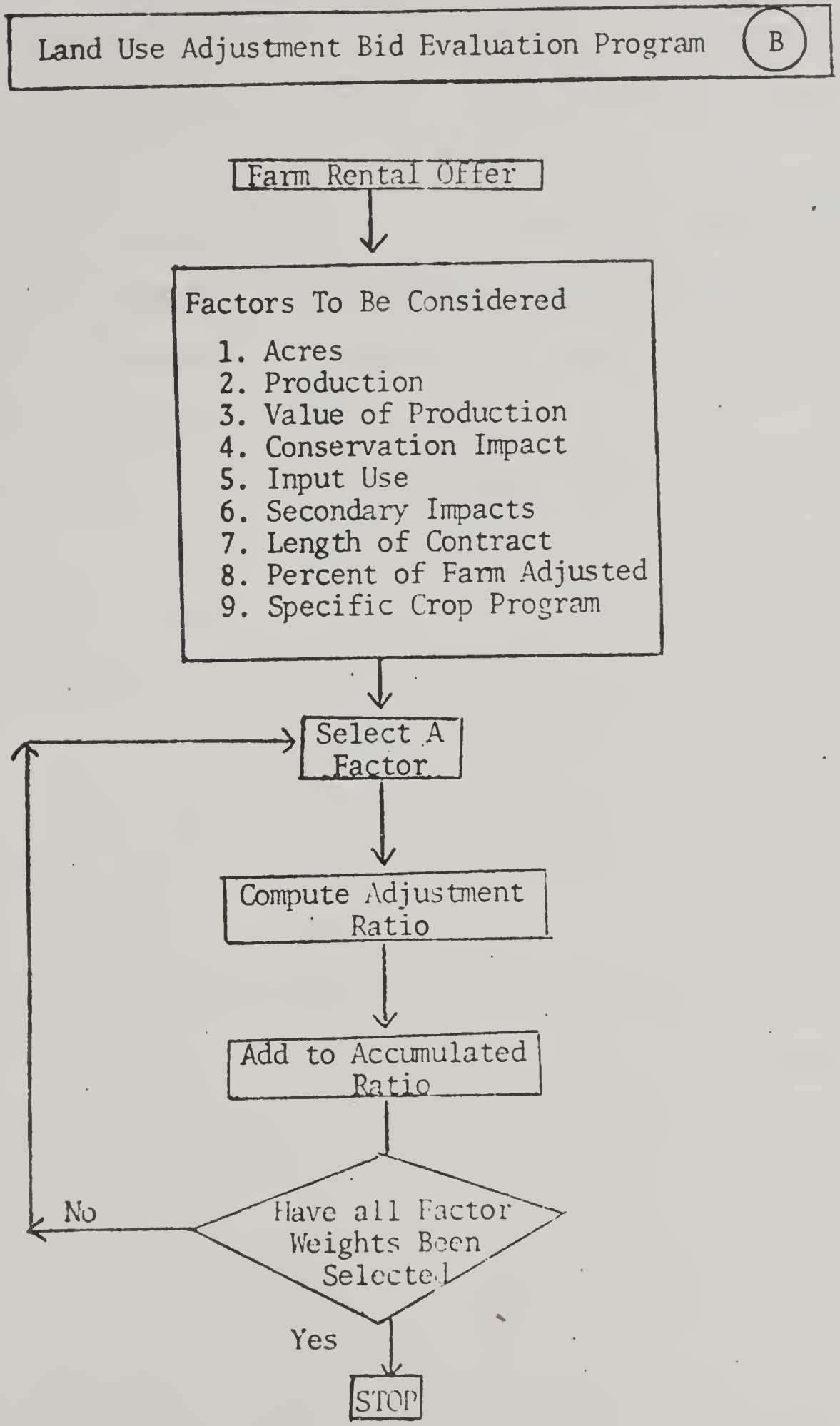


Figure 2


Land Use Adjustment Bid Evaluation Program
B
Farm Rental Offer
Factors To Be Considered
1. Acres
2. Production
3. Value of Production
4. Conservation Impact
5. Input Use
6. Secondary Impacts
7. Length of Contract
8. Percent of Farm Adjusted
9. Specific Crop Program
Select A Factor
Compute Adjustment Ratio
Add to Accumulated Ratio
Have all Factor Weights Been Selected
No
Yes
STOP

would be ranked according to a specified system for final bid selection. The value would be based on the bid specified by the farmer adjusted for the various weighting factors such as productivity, economic impacts and input use.

The final bid adjusted for selection has many possibilities. Some of the bid adjustments could be straight forward and mechanical. Others would require development and substantial research to get the weights to be attached to each factor.

Some of the possibilities for factors to consider in the selection are:

(1) Acres of land:

The bid would be on the basis of dollars per acre. Further refinement could be made by evaluating the productivity index for the acre so that poorer and better land could be evaluated at the same dollar per productivity unit weight.

(2) Production of a commodity:

The bid would be dollars per production unit. This type of criterion would be more suitable for a single commodity adjustment program.

(3) Value of production per dollar spent:

This criterion is generally accepted as an efficient use of government funds.[4/] The bid that the farmer submits could be dollars per acre or dollars per unit of production. The subroutine would develop average value of production per acre or production unit for the farm. This average value of production would be divided by the bid to determine the value of production per dollar spent. The average value of production

could be determined as follows:

$$W = \sum_{i=1}^{n} \frac{A_{ci} \cdot Y_{ci} \cdot P_{ci}}{A_T}$$

where W = average value of production per acre for the farm,

A_{ci} = average acreage of crop i on the farm,

Y_{ci} = projected or normal yield for crop i on the farm,

P_{ci} = expected price for crop i for the farm, and

A_T = total cropland acres on the farm.

For value of crops such as hay and cropland pasture it will probably be necessary to develop an average for the county or state to use in the formula, since the yield and expected price values may be difficult to determine for individual farms. It might be suitable to use county productivity indices and then develop a ratio for each farm on the basis of the deviations from the county norm.

Other goals or objectives could be included in a weighting formula and applied to the basic bid before evaluation. A few objectives for which weights could be developed and applied, if desired, are:

(1) An erosion coefficient. Soil conservation could be an important aspect of land adjustment. Thus a premium might be added for retiring from production land which is erosion prone and a discount applied to a bid which brought such land into production. To make this effective, an erosion index for the farm, county, or area would need to be developed and added to the basic data for the farm. Then a weight would be developed indicating the importance of this factor in the total

bid consideration. It is likely that the importance will change from program to program and year to year as the objectives change.

(2) The economic impact on the area. Agricultural production is a much greater part of the economic activity of some areas than others. Also some areas' agricultural economy is more dependent on one crop or activity. Weighting factors could be developed so that program participation could be selected to both minimize and equalize the economic impact for various areas.

(3) Input of resources into agriculture. In times of input shortages, crop production adjustments could be weighted on the basis of inputs used for the crop or region. Cropland use adjustments could be weighted to favor input savings to relieve scarcity.

(4) Length of contract. There may be situations with some programs where short term or long term contracts may be more desirable than the other. Thus, if both types of bids are received in the same program, weights could be developed to give more consideration to the most desirable contract.

(5) Part-farm versus whole farm adjustment. Under some programs, a differential between part farm and whole farm adjustments may be desirable. Weights can inhance the consideration of the more desirable.

The use of any of the above factors in the adjustment criterion would require substantial analysis to determine the applicable weights. If the factors are important and should be used (and there may be others),

then research efforts are required to determine the value of such factors, when they are valuable, and how this value could be quantified for inclusion in the bid evaluation program.

The final output of the land use adjustment bid evaluation subroutine would be the adjusted bid after all weighting factors are considered. This would be a single value which could be arrayed with the final value for area bids to facilitate the selection process. An example of the use of the weighting system is shown in the appendix.

Limits

Any cropland adjustment program will have some constraints. These would likely be accounted for by limits. The application of these limits could range from very general geographic area (total U.S.) to very specific areas (regions, subregions, or counties).

Limit specifications could be set so that the system could operate. These could be in terms of:

(1) Maximum percent of cropland to adjust,

(2) Maximum and/or minimum percent of production to adjust,

(3) Maximum treasury or government costs to permit,

(4) Maximum or minimum inputs which could be used or which could be adjusted in production,

(5) Income.

With further research other factors could be considered which could make the land use adjustment program a much more useful tool to meet specific objectives and could eliminate some criticism of more general programs. These could include:

(1) Relation of marginal cost of adjusting the cropland to the marginal cost of purchase and storage of the excess production,

(2) Relation of foreign trade and balance of trade value of excess production to the cost of land use adjustment.

Most of this set of criteria would likely be used in combination with one or more of the limits since there will more than likely always be a maximum limit on acres to be adjusted, or government costs or both.

Bid Selection

The bid selection routine could be developed in several ways. The bids could be ranked totally for the U.S. However, if the limits on selection are specified for subdivisions of a size smaller than U.S. total, then the bids must be identified so that they can be assigned and checked against these limits. Program specifications will determine whether it is necessary for each bid to compete against every bid in the United States or only against bids and the limits specified for its sub strata.

Bid selection is a straight forward computer operation. The adjusted bid from the adjustment bid evaluation subroutine would be ranked according to a specified procedure, highest or lowest first. The first ranked bid would be selected and stored with the associated program data for that farm number. The system would check to see if any limit had been reached. If not, another bid would be taken and continue until limits had been reached. When limits are reached or when all bids had been evaluated the system would continue to the contract printing, and the accounting procedures.

Contract Printing

The base information for each bid selected would be printed out in a specified form. This information could include (1) acreage in farm, (2) acreage adjusted, (3) bid price accepted, (4) total value of bid per

year, (5) years of contract, (6) performance required and (7) other desirable information. If desirable this subroutine could develop a check form and print the check for the first payment on the contract.

Accounting Procedures

One of the major tasks of any program is to develop an accounting of the effects and cost of the program. While the information is still in the computer, subroutines could develop most of the accounting statements necessary for the program. The accounting sheets could be developed for counties, states, regions and U.S. total. They could include aggregate and per unit classification.

Summary and Conclusions

Land use adjustment has been a tool of agricultural programs for many years. Land use adjustment has been synonymous with land retirement in past years. However programs can be developed which could induce production or alter production practices as well.

A major objection to previous programs has been that the fixed rate of compensation for the adjustment has meant that many producers were paid much more than was actually necessary to induce them to make the adjustment. Thus much of the payment was an income transfer to producers rather than compensation for cost of adjustment performed.

A theoretically more efficient way to administer an adjustment program is a competitive bid system. However, except for a pilot program in the late fifties, no major attempt has been made to use a bid system.

It has been the purpose of this report to indicate how a computer system could be developed to handle the mechanics of a nationally competitive bid system, make the selection on specified and consistent selection

criteria and get the information back to the producer in a timely manner.

The computer routine would be very general and would be made specific by the specifications for the particular program. It would be capable of handling programs designed to retire land or crops from production or to induce bringing additional land into production, to increase production of specific crops, or to induce alternate production practices.

How A Weighting Factor System Could Work

Land adjustment programs based on a cost or value per acre concept gives little consideration to the varying effect that such programs could have on the economy of the areas, soil conservation of the area, etc. Measures exist or can be developed which could be used to evaluate these factors in making the final decision on land use adjustments.

How could these measures be used? Take Oklahoma as an example. A land retirement program is to be initiated for which the lowest bid per acre will be accepted. The desire is to retire 1,000 acres. Four bids at $30.00 per acre are received for 500 acres each, one each in area 200, 300, 400, and 600.

It is the desire to retire the land from areas which will have the least adverse effect on the economy. Type I and II 1-0 income multipliers are available for each area, (Table I). The multipliers represent the effect that a dollar change in income from crop production would have on the economy of the area. Type I multipliers include the total income impact resulting from the one dollar direct change in the crop sector and the indirect impact occurring in the area due to a change in business spending. Type II multipliers include the total income impact resulting from the one dollar direct income change in the crops sector and the indirect and induced impact occurring in the area due to a change in business and household spending.

In order to weight the bids for the selection model, a norm for the multipliers would be established. For our purposes, set it at 1.47, the average of the seven Type I multipliers. Since a low multiplier means less affect on the area economy from a dollar change in income in that industry; we would want to take more land out of these areas than areas of high multiplier effect. Thus a formula could be developed which reduced the bid by 1 percent for each one hundredth the area multiplier is below the norm and increase the simularity for areas above the norm.

Thus with the hypothetical bids, area 200 would be reduced 10% to 27.00 per acre, area 300 reduced 1% to $29.70, area 400 increased 2% to $30.60 and area 600 increased by 5% to $31.50. Thus when the bids are arrayed for selection, the actual bid would be the same for all four areas. However, the adjusted value for selection would array area 200 lowest area 300 next, area 400 and area 600. The program would select the bid from area 200 and area 400 for participation in the adjustment program.

The above is an example only. For the system to work, careful evaluation is needed concerning the norm, the value to assign to deviations and the type of adjustment desired. Also multipliers may not be available for all areas of the United States. If they are available it would be necessary to determine the consistancy of the method of estimation.

Columns three and four of the table list some factors used in evaluating the erodability of soils. These and other factors could likely be developed and used to make adjustment for soil conservation effects of land use adjustment. The development and use of the bid evaluation adjustments would require cooperation research effects from several areas of work.

Table 1

Factors Which Could be Used in Bid Evaluation Adjustments, by FEDS Areas Oklahoma

Area[1]	Type I Ag. Income[2]	Type II Ag. Multiplier	Soil Conservation Factor[3] Average Rainfall	K
700	1.494	1.972	280	.26
800	1.404	1.750	300	.28
600	1.532	2.12	300	.26
500	1.527	2.12	280	.28
400	1.496	2.02	240	.40
300	1.46	1.90	200	.36
200	1.37	1.68	140	.30
100	1.37	1.68	140	.30
State	1.77	3.08		

[1] Area notation refers to the production areas defined for the Farm Enterprise Data System, CED.

[2] Ag. Multipliers are the income multipliers for the Crops and Forestry Sector for the sub state planning district nearest the FEDS Area designation. Projections and Analyses of the Economics of Substate Planning Districts in Oklahoma. The Ozarks Regional Commission, Sept., 1974. See: Schreiner, Dean F., and James C. Chang.

[3] These are factors which are used with other factors in the soil erodability equation. These factors are developed for each soil association. The numbers shown are rough averages for the total FEDS area. They are not averages developed by SCS.

FOOTNOTES

1/ Opinions expressed are those of the author and do not necessarily represent the official views of the United States Department of Agriculture. The author acknowledges the assistance of fellow workers in the Commodity Program and Policy Analysis Area of Commodity Economics Division in conceptualizing and designing the model. Special appreciation to Rudie W. Slaughter, Jr. for research leadership; Dr. Slaughter, Dr. Milton Ericksen and Dr. Thomas Miller of the Commodity Economics Division and Dr. Daryll Ray of Oklahoma State University reviewed and critiqued an earlier draft of the paper and made very helpful comments.

2/ Bottom, et al. (1) discussed the pilot program and made some analysis of the results.

3/ ASCS has a centralized computer system in Kansas City. One of the possibilities being explored is the development of a masterfile with the basic data (acreages, allotments, projected yields for each farm unit in the U.S.

4/ See Carr and Tweeten (2) for an evaluation of the efficiency criterion.

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